Complete Summary

GUIDELINE TITLE

Yellow fever vaccine. Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2002.

BIBLIOGRAPHIC SOURCE(S)

Cetron MS, Marfin AA, Julian KG, Gubler DJ, Sharp DJ, Barwick RS, Weld LH, Chen R, Clover RD, Deseda-Tous J, Marchessault V, Offit PA, Monath TP. Yellow fever vaccine. Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2002. MMWR Recomm Rep 2002 Nov 8;51(RR-17):1-11. [57 references] PubMed

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Yellow fever, including urban yellow fever and jungle yellow fever

GUIDELINE CATEGORY

Prevention

CLINICAL SPECIALTY

Infectious Diseases
Pathology
Pharmacology
Preventive Medicine

INTENDED USERS

Allied Health Personnel
Clinical Laboratory Personnel
Physicians
Public Health Departments

GUIDELINE OBJECTIVE(S)

To present updated recommendations for the use of yellow fever vaccine from the previous Centers for Disease Control and Prevention (CDC) report, Yellow Fever Vaccine: Recommendations of the Advisory Committee on Immunizations Practices: MMWR 1990;39(RR-6):1-6.

TARGET POPULATION

Individuals of all ages at risk of exposure to yellow fever, such as persons living or traveling in endemic areas, laboratory personnel, and individuals planning international travel

INTERVENTIONS AND PRACTICES CONSIDERED

1. Primary vaccination and booster doses of yellow fever vaccination, made from the 17D, 17D-204 (YF-VAX®, ARILVAX™), 17DD, yellow fever virus strain
2. Monitoring for adverse effects of vaccination
3. Serologic tests, as indicated, to determine if a specific yellow fever immune response exists
4. Simultaneous administration of yellow fever vaccination with other vaccines

MAJOR OUTCOMES CONSIDERED

- Incidence of yellow fever
- Relative efficacy and safety of the yellow fever vaccine
- Vaccination related side effects or adverse events, including risk and incidence of vaccine-associated disease

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Not stated

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not applicable

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Vaccine Use

Persons Living or Traveling in Endemic Areas

Persons aged ≥9 months who are traveling to or living in areas of South America and Africa where yellow fever infection is officially reported should be vaccinated. These areas are listed in the "Bi-Weekly Summary of Countries with Areas Infected with Quarantinable Diseases," available at state and local health departments. Information concerning known or probable infected areas is also available from World Health Organization (WHO) (http://www.who.int), the Pan

American Health Organization, the Division of Vector-Borne Infectious Diseases (telephone: 970-221-6400) or the Division of Global Migration and Quarantine (telephone: 404-498-1600) at the Centers for Disease Control and Prevention (CDC), or at http://www.cdc.gov/travel.

Vaccination is also recommended for travel to countries that do not officially report the disease but that lie in the yellow fever-endemic zone (refer to the figure in the original guideline document). Because of incomplete surveillance, the actual areas of yellow fever virus activity might exceed the infected zones officially reported by individual ministries of health.

The manufacturer and the Food and Drug Administration (FDA) recommend that vaccination of infants aged <9 months be avoided because of the risk for encephalitis, and that travel of such persons to countries in yellow fever-endemic zones or to countries experiencing an epidemic be postponed or avoided, whenever possible. Using yellow fever vaccine among infants aged <9 months has not been formally evaluated. In unusual circumstances, physicians considering vaccinating infants aged <9 months or pregnant women should contact the Division of Vector-Borne Infectious Diseases (telephone: 970-221-6400) or the Division of Global Migration and Quarantine (telephone: 404-498-1600) at CDC for advice (see Precautions and Contraindications).

The Advisory Committee on Immunization Practices (ACIP) and the World Health Organization recognize that situations occur in which vaccination of an infant aged <9 months might be considered. One such situation is the unavoidable exposure of children aged 6-8 months to an environment where an increased likelihood of becoming infected with the yellow fever virus exists (e.g., a setting of endemic or epidemic yellow fever). Because of the risk for encephalitis, in no instance should infants aged <6 months receive yellow fever vaccine.

Because the seroconversion rate after vaccination of pregnant women might be markedly reduced compared with that of other healthy women, serologic tests to determine if a specific yellow fever immune response exists should be considered. To discuss the need for serologic testing, the appropriate state health department or the Division of Vector-Borne Infectious Diseases (telephone: 970-221-6400) or the Division of Global Migration and Quarantine (telephone: 404-498-1600) at CDC should be contacted (see Precautions and Contraindications).

Laboratory Personnel

Laboratory personnel who might be exposed to virulent yellow fever virus or to concentrated preparations of the 17D vaccine strain by direct or indirect contact or by aerosols should also be vaccinated.

Requirements for Vaccination Before International Travel

For purposes of international travel, yellow fever vaccines produced by different manufacturers worldwide must be approved by the World Health Organization and administered at an approved yellow fever vaccination center. In addition to CDC's Division of Global Migration and Quarantine, state and territorial health departments have the authority to designate nonfederal vaccination centers; these centers can be identified by contacting state or local health departments.

Vaccinees should receive an International Certificate of Vaccination that has been completed, signed, and validated with the center's stamp when the vaccine is administered. Vaccination for international travel might be required under circumstances other than those specified in this report. Certain countries in Africa require evidence of vaccination from all entering travelers. Other countries might waive the requirements for travelers coming from areas where no evidence exists of substantial risk for yellow fever and who are staying <2 weeks. Because requirements might change, all travelers should seek up-to-date information from health departments, CDC, and the World Health Organization. Travel agencies, international airlines, or shipping lines also should have up-to-date information. Certain countries require persons, even if only in transit, to have valid International Certificates of Vaccination if they have been in countries either known or thought to have yellow fever virus. Such requirements might be enforced strictly, including for persons traveling from Africa or South America to Asia. Travelers should consult CDC's travel information website at http://www.cdc.gov/travel to determine requirements and regulations for vaccination.

Primary Vaccination

For persons of all ages for whom vaccination is indicated, a single subcutaneous injection of 0.5 mL of reconstituted vaccine is used.

Booster Doses

The International Health Regulations require revaccination at intervals of 10 years. Revaccination can boost antibody titer; however, evidence from multiple studies demonstrates that yellow fever vaccine immunity persists for 30-35 years and probably for life.

Precautions and Contraindications

Age

The manufacturer and the Food and Drug Administration (FDA) recommend that vaccination of infants aged <9 months be avoided because of the risk for encephalitis, and that travel of such persons to countries in yellow fever-endemic zones or to countries experiencing an epidemic should be postponed or avoided, whenever possible. In unusual circumstances, physicians considering vaccinating infants aged <9 months who are traveling to endemic areas should contact the Division of Vector-Borne Infectious Diseases (telephone: 970-221-6400) or the Division of Global Migration and Quarantine (telephone: 404-498-1600) at CDC for advice.

Travelers aged ≥65 years should discuss with their physicians the risks and benefits of vaccination in the context of their destination-specific risk for exposure to yellow fever virus. Nevertheless, yellow fever remains a key cause of illness and death in South America and sub-Saharan Africa where potential yellow fever transmission zones have expanded to urban areas with substantial populations of susceptible humans and the Ae. aegypti vector mosquito. In addition, unvaccinated United States travelers to South America have contracted fatal yellow fever. Consequently, despite these rare adverse events, yellow fever

vaccination of travelers to high-risk areas should be encouraged as a key prevention strategy.

Pregnancy

The safety of yellow fever vaccination during pregnancy has not been established, and the vaccine should be administered only if travel to an endemic area is unavoidable and if an increased risk for exposure exists. Information from limited clinical trials in Africa and Europe indicates that the risk from vaccination for pregnant women who cannot avoid mosquito exposure in yellow fever-endemic areas is outweighed by the risk for yellow fever infection. If international travel requirements are the only reason to vaccinate a pregnant woman, rather than an increased risk for infection, efforts should be made to obtain a waiver letter from the traveler's physician (refer to the Appendix in the original guideline document). Pregnant women who must travel to areas where the risk for yellow fever infection is high should be vaccinated and, despite the apparent safety of this vaccine, infants born to these women should be monitored closely for evidence of congenital infection and other possible adverse effects resulting from yellow fever vaccination. If vaccination of a pregnant woman is deemed necessary, serologic testing to document an immune response to the vaccine can be considered, because the seroconversion rate for pregnant women in a developing nation has been reported to be substantially lower than that observed for other healthy adults and children. To discuss the need for serologic testing, the appropriate state health department or the Division of Vector-Borne Infectious Diseases (telephone: 970-221-6400) or the Division of Global Migration and Quarantine (telephone: 404-498-1600) at CDC should be contacted.

Nursing Mothers

Whether this vaccine is excreted in human milk is unknown. No reports exist of adverse events or transmission of the 17D vaccine viruses from nursing mother to infant. However, as a precautionary measure, vaccination of nursing mothers should be avoided because of the theoretical risk for the transmission of 17D virus to the breast-fed infant. When travel of nursing mothers to high-risk yellow fever-endemic areas cannot be avoided or postponed, such persons can be vaccinated.

Altered Immune Status

Infection with yellow fever vaccine virus poses a theoretical risk for encephalitis to 1) patients with acquired immunodeficiency syndrome (AIDS); 2) patients who are infected with human immunodeficiency virus (HIV) and have other manifestations of HIV infection; 3) patients with leukemia, lymphoma, generalized malignancy; or 4) those whose immunologic responses are suppressed by corticosteroids, alkylating drugs, antimetabolites, or radiation. Such patients should not be vaccinated. If travel to a yellow fever-infected zone is necessary, patients should be advised of the risks posed by such travel, instructed in methods for avoiding vector mosquitoes, and supplied with vaccination waiver letters by their physicians (see Appendix in the original guideline document). Low-dose (i.e., 20-mg prednisone or equivalent/day), short-term (i.e., <2 weeks) systemic corticosteroid therapy or intra-articular, bursal, or tendon injections with corticosteroids should not be sufficiently immunosuppressive to constitute an increased hazard to recipients of yellow fever vaccine.

Persons who are HIV-infected but do not have AIDS or other symptomatic manifestations of HIV infection, who have established laboratory verification of adequate immune system function, and who cannot avoid potential exposure to yellow fever virus should be offered the choice of vaccination.

If international travel requirements are the only reason to vaccinate an asymptomatic HIV-infected person, rather than an increased risk for infection, efforts should be made to obtain a waiver letter from the traveler's physician (refer to the Appendix in the original guideline document). Asymptomatic HIV-infected persons who must travel to areas where the risk for yellow fever infection is high should be offered the choice of vaccination and monitored closely for possible adverse effects.

Because vaccination of asymptomatic HIV-infected persons might be less effective than that for persons not infected with HIV, measurement of their neutralizing antibody response to vaccination should be considered before travel. To discuss the need for serologic testing, the appropriate state health department or the Division of Vector-Borne Infectious Diseases (telephone: 970-221-6400) or the Division of Global Migration and Quarantine (telephone: 404-498-1600) at CDC should be contacted. Family members of immunosuppressed or HIV-infected persons, who themselves have no contraindications, can receive yellow fever vaccine.

Hypersensitivity

Yellow fever vaccine is produced in chick embryos and should not be administered to persons hypersensitive to eggs; typically, persons who are able to eat eggs or egg products can receive the vaccine. If international travel regulations are the only reason to vaccinate a patient hypersensitive to eggs, efforts should be made to obtain a waiver (refer to the Appendix in the original guideline document). If vaccination of a person with a questionable history of egg hypersensitivity is considered essential because of a high risk for exposure, an intradermal test dose can be administered under close medical supervision. Specific directions for skin testing are located in the package insert.

Simultaneous Administration of Other Vaccines

Determination of whether to administer yellow fever vaccine and other immunobiologics simultaneously should be made on the basis of convenience to the traveler in completing the desired vaccinations before travel and on information regarding possible interference. The following discussion should help guide these decisions.

Limited clinical studies have demonstrated that the serologic response to yellow fever vaccine is not inhibited by the administration of certain other vaccines concurrently or at intervals of a 1 day-1 month. Measles, smallpox, and yellow fever vaccines have been administered in combination; Bacillus Calmette-Guérin (BCG) and yellow fever vaccines have been administered simultaneously without interference.

Yellow fever vaccine can be administered concurrently with hepatitis A or hepatitis B vaccines. In addition, yellow fever vaccine has been administered concurrently

with the typhoid fever vaccine, Typhim Vi® (manufactured by Aventis Pasteur, Inc., Swiftwater, Pennsylvania) and the meningococcal vaccine, Menomune® (Aventis Pasteur, Inc., Swiftwater, Pennsylvania), with no reported evidence of an effect on the immune response to any of the three vaccines individually and no unusual safety problems. No data exist regarding possible interference between yellow fever and rabies or Japanese encephalitis vaccines.

In a prospective study of persons administered yellow fever vaccine and an intramuscular dose of commercially available immune globulin, no alteration of the immunologic response to yellow fever vaccine was detected when compared with controls. Although chloroquine inhibits replication of yellow fever virus in vitro, it does not adversely affect antibody responses to yellow fever vaccine among humans receiving antimalaria prophylaxis.

Refer to the original guideline document for a discussion of surveillance and research priorities.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is not specifically stated for each recommendation.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Appropriate utilization of yellow fever vaccine to minimize the risk and rate of adverse effects
- Prevention of yellow fever
- Decreased incidence of yellow fever

POTENTIAL HARMS

General Reactions to Yellow Fever Vaccine

- Mild reactions. Reactions to 17D yellow fever vaccine are typically mild. After vaccination, vaccinees have reported mild headaches, myalgia, low-grade fevers, or other minor symptoms for 5-10 days. In clinical trials, where symptoms are actively elicited, incidence of mild adverse events has been $\leq$25%. Approximately 1% of vaccinees curtail regular activities.
- Immediate hypersensitivity reactions. Immediate hypersensitivity reactions, characterized by rash, urticaria, or asthma, are uncommon (i.e., an estimated incidence of 1/130,000-250,000). Vaccine strain viremia after primary

vaccination with yellow fever vaccine frequently occurs among healthy persons, but is usually waning or absent after the first week.

Vaccine-Associated Disease

- Yellow fever vaccine-associated neurotropic disease. Historically, yellow fever vaccine-associated neurotropic disease (formerly known as postvaccinal encephalitis) among children has been the most common serious adverse event associated with yellow fever vaccines. The occurrence of vaccine-associated neurotropic disease does not appear to be confined to infants but does appear to be limited. The risk for vaccine-associated neurotropic disease has been estimated as <1/8,000,000 persons.
- Vaccine-associated viscerotropic disease. Recently, a new serious adverse reaction syndrome has been described among recipients of different yellow fever vaccines. This syndrome was previously reported as febrile multiple organ system failure, and is now called yellow fever vaccine-associated viscerotropic disease. Accurately measuring the incidence of this rare vaccine-associated viscerotropic disease is impossible because adequate prospective data are unavailable; however, crude estimates of the reported frequency range from 0.09 (in Brazil) to 2.5 (in the United States) per 1,000,000 doses distributed. The real incidence might be higher.

Subgroups Most Likely to be Harmed:

- Hypersensitivity. Hypersensitivity reactions occur principally among persons with histories of allergies to egg or other substances.
- Age and altered immune status. Infants aged <6 months are likely to be more susceptible to the serious adverse reaction of yellow fever vaccine-associated neurotropic disease (also known as postvaccinal encephalitis) than older children, and vaccination of infants aged <6 months is contraindicated. The risk for this complication appears age-related.

  A recent analysis of adverse events passively reported to the Vaccine Adverse Event Reporting System (VAERS) during 1990-1998 indicates that persons aged ≥65 years might be at increased risk for systemic adverse events after vaccination, compared with younger persons.

  Infection with yellow fever vaccine virus poses a theoretical risk for encephalitis to 1) patients with acquired immunodeficiency syndrome (AIDS); 2) patients who are infected with human immunodeficiency virus (HIV) and have other manifestations of human immunodeficiency virus infection; 3) patients with leukemia, lymphoma, generalized malignancy; or 4) those whose immunologic responses are suppressed by corticosteroids, alkylating drugs, antimetabolites, or radiation.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- The safety of yellow fever vaccination during pregnancy has not been established.

- Whether this vaccine is excreted in human milk is unknown. No reports exist of adverse events or transmission of the 17D vaccine viruses from nursing mother to infant.
- Data regarding seroconversion rates after yellow fever vaccination among asymptomatic human immunodeficiency virus (HIV)-infected persons are limited.
- Despite the theoretical risk for neuroinvasion and encephalitis among human immunodeficiency virus-infected persons, clinical or epidemiologic studies to evaluate the risk for yellow fever vaccination among such recipients have not been reported.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness
Safety

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Cetron MS, Marfin AA, Julian KG, Gubler DJ, Sharp DJ, Barwick RS, Weld LH, Chen R, Clover RD, Deseda-Tous J, Marchessault V, Offit PA, Monath TP. Yellow fever vaccine. Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2002. MMWR Recomm Rep 2002 Nov 8;51(RR-17):1-11. [57 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2002 Nov 8

GUIDELINE DEVELOPER(S)

Centers for Disease Control and Prevention - Federal Government Agency [U.S.]

SOURCE(S) OF FUNDING

United States Government

GUIDELINE COMMITTEE

Yellow Fever Working Group

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Working Group Members: Martin Cetron, M.D., Anthony A. Marfin, M.D., Kathleen G. Julian, M.D., Duane J. Gubler, Sc.D., Donald Sharp, M.D., Rachel S. Barwick. Ph.D., Leisa H. Weld, Ph.D., and Robert Chen, M.D., CDC, Atlanta, Georgia; Richard D. Clover, M.D., American Academy of Family Physicians, Louisville, Kentucky; Jaime Deseda-Tous, M.D., San Jorge Children´s Hospital, San Juan, Puerto Rico; Victor Marchessault, M.D., Canadian National Advisory Committee on Immunization, Cumberland, Ontario, Canada; Karen Midthun, M.D., and Lewis Markoff, M.D., Food and Drug Administration, Bethesda, Maryland; and Paul A. Offit, M.D., Children´s Hospital of Philadelphia, Philadelphia, Pennsylvania.

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previously released version: Yellow Fever Vaccine: Recommendations of the Advisory Committee on Immunizations Practices: MMWR 1990;39(RR-6):1-6.

GUIDELINE AVAILABILITY

Electronic copies: Available from the Centers for Disease Control and Prevention (CDC) Web site:

- HTML Format
- Portable Document Format (PDF)

Print copies: Available from the Centers for Disease and Control Prevention, MMWR, Atlanta, GA 30333. Additional copies can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325; (202) 783-3238.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on March 17, 2003.

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Date Modified: 11/15/2004